

REMARKS

This paper is being provided in response to the April 1, 2002 Office Action for the above-referenced application. In this response, applicant has amended the specification in accordance with the guidelines provided in the Office Action. Applicant respectfully submits that this modification does not add new matter.

The objection to the specification, specifically to the form of the abstract, has been addressed by the amendments contained herein. Specifically, the abstract has been rewritten to remove the objectionable language forms without changing any of the meaning of the specification as compared to the as filed language. In view of the above, applicant respectfully requests that this objection be withdrawn.

The rejection of claims 1-2, 4 and 6 under 35 U.S.C. §103(a) as being unpatentable over Isozaki (U.S. Patent No. 5,128,570, hereinafter referred to as "Isozaki") in view of Mizutani et al (U.S. Patent No. 4,823,038, hereinafter referred to as "Mizutani") and further in view of Beyers (U.S. Patent No. 3,525,005, hereinafter referred to as "Beyers") is hereby traversed and reconsideration thereof is respectfully requested. Applicants respectfully submit that claims 1-2, 4 and 6 are patentably distinct over the cited references, whether taken alone or in any combination.

Independent claim 1 recites a DC motor with a rotor unit having a cylindrical field magnet with a rotating shaft press fit at the center. The cylindrical magnet has S and N poles that alternate in a circumferential direction. There is a stator unit arranged circumferentially around the rotor made of a plurality of stator yokes. The yokes are made of a large number of thin plates, each of which is a salient pole, and a plurality of

coil units made by winding a magnetic wire on a bobbin. Each of the S and N poles has a plurality of stage in the axial direction, and are circumferentially shifted from each other by a predetermined phase shift. Claims 2-7 depend from independent claim 1, and recite additional patentable features over the base claim, such as the shift being in a range of 12 to 50 degrees, a rotor position detector, the motor being either an inside or an outside brushless motor, and the motor being a three phase, eight pole and six stator type motor.

The cited reference of Isozaki discloses a hybrid type stepping motor which has a layered arrangement of stators in which there are laminated metal plates which are interconnected to one another in an axial direction of the rotor shaft. Isozaki shows a stator unit having a salient pole wound by a magnet wire. There is apparently no disclosure in Isozaki of a cylindrical field magnet that has a rotating shaft press fit in the center, or that the S and N poles alternate with each other around the circumference. Nor is there any reason why the cited reference would do so, since it is a stepper motor that does not have any problem with either cogging or noise.

The cited reference of Mizutani discloses a two phase claw pole type stepping motor having a rotor assembly with a permanent magnet block 21 divided axially at an intermediate portion. This forms an upper pole section 21 a and a lower pole section 21 b. The phase difference the respective magnetic poles of the upper and the lower pole sections 21a and 21b, is disclosed as being at an electrical angle of 90 degrees (i.e., half π). The disclosed arrangement provides a stepping motor having increased torque capacity by use of incorporating yokes having an increased number of winding turns in

the coils, and having a permanent magnet rotor. The disclosed arrangement requires that the permanent magnet block be divided into two pieces around the middle of the axial location, and requires that the separated upper and lower pole pieces be supplied with current having a 90 degree phase difference.

The cited reference of Beyers discloses an axial air gap alternator. The Office Action uses the cited reference to show that it is known to have the field magnet on a shaft.

Applicant respectfully submits that the cited reference does not describe or suggest at least the recited combination of features of "*... a plurality of stator yokes so arranged as to oppose said field magnet with a small gap, each of said stator yokes being formed by circumferentially stacking a large number of thin plates each of which constitute a salient pole ... each of the S and N poles ... shifted from each other in the circumferential direction ... with a predetermined shift amount ...*", as set forth in applicant's independent claim 1. Rather, Isozaki is a stepper motor that is not circumferential, Mizutani is not formed of a large number of thin plates and does not have the shift in each one of the stators, and Beyers is an alternator.

Furthermore, as described in the present application, the arrangement set forth in applicant's claim 1 reduces cogging torque. In contrast, it is not clear that the arrangements of Isozaki or Mizutani are capable of reducing cogging torque in the same

way. In addition, since Beyers discloses an alternator, then, of course, cogging torque is not a concern.

For at least the above discussed reasons, applicant respectfully submits that independent claim 1, and thus dependent claims 2-7, which depend from claim 1, are patentable over the cited references, whether taken alone or in any combination, and respectfully requests that this rejection be withdrawn.

The rejection of claim 3 under 35 U.S.C. §103(a) as being unpatentable over Isozaki in view of Mizutani, Beyers and Hoemann et al (U.S. Patent No. 5,034,642, hereinafter referred to as "Hoemann") is hereby traversed and reconsideration thereof is respectfully requested. Applicant respectfully submits that claims, as amended herein, are patentable over the cited references, whether taken separately or in any combination.

The features of the independent claim 1 are discussed above. Dependent claim 3 further recites that the rotor position detection element is adjusted by $\frac{1}{2}$ of the shift amount of the respective stages.

The cited references of Isozaki, Beyers and Mizutani are discussed above. The cited reference of Hoemann is used by the Office Action to show that the recited feature of the $\frac{1}{2}$ shift for the position detector is known, discloses a permanent magnet rotor position detecting sensor that is arranged on a neutral line, as shown in the figures 5, 6 and 7 at the location marked "sensor location". This is also found in the specification at column 3, lines 30-52, and in claim 5.

Applicant respectfully submits that the addition of the Hoemann reference does nothing to correct the above noted deficiencies set forth above with respect to the other cited references. Specifically, the features of "*... a plurality of stator yokes so arranged as to oppose said field magnet with a small gap, each of said stator yokes being formed by circumferentially stacking a large number of thin plates each of which constitute a salient pole ... each of the S and N poles ... shifted from each other in the circumferential direction ... with a predetermined shift amount ...*", as set forth in applicant's independent claim 1, are not described nor suggested by the prior art, either alone or taken in any combination.

Since the independent claim has been shown to be in patentable condition over the suggested combination of references, then the dependent claim 3 is also in patentable condition. Therefore, applicant respectfully requests that the rejection of claim 3 be reconsidered and withdrawn.

The rejection of claims 5 and 7 under 35 U.S.C. §103(a) as being unpatentable over Isozaki in view of Mizutani, Beyers, and further in view of Nakagawa et al (U.S. Patent No. 5,334,894, hereinafter referred to as "Nakagawa") is hereby traversed and reconsideration thereof is respectfully requested. Applicant respectfully submits that claims 5 and 7, as amended herein, are patentable over the cited references, whether taken separately or in any combination.

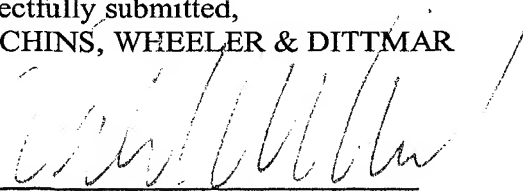
The features of the claims and the cited references of Isozaki, Mizutani, and Beyers are discussed above. The cited reference Nakagawa discloses an outer rotor type rotary pulse motor, and is used by the Office Action to show that outer rotor type brush less DC motors are known in the art.

Applicant respectfully submits that the addition of the Nakagawa reference does nothing to correct the above noted deficiencies set forth above with respect to the other cited references. Specifically the features of "*... a plurality of stator yokes so arranged as to oppose said field magnet with a small gap, each of said stator yokes being formed by circumferentially stacking a large number of thin plates each of which constitute a salient pole ... each of the S and N poles ... shifted from each other in the circumferential direction ... with a predetermined shift amount ...*", as set forth in applicant's independent claim 1, are not described nor suggested by the prior art, either alone or taken in any combination.

Since the independent claim has been shown to be in patentable condition over the suggested combination of references, then the dependent claims 5 and 7 are also held to be in patentable condition. Therefore, applicant respectfully requests that this rejection be withdrawn.

Based on the above, applicant respectfully requests that the Examiner reconsider and withdraw all outstanding rejections and objections. Favorable consideration and allowance are earnestly solicited. Should there be any questions after reviewing this paper, the Examiner is invited to contact the undersigned at 617-951-6676.

Respectfully submitted,
HUTCHINS, WHEELER & DITTMAR



Donald W. Muirhead
Registration No. 33,978

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Patent Group
Hutchins, Wheeler & Dittmar
101 Federal Street
Boston, MA 02110